

Proceedings of University of Delaware

Land Use Change and Water Quality:

Assessing the Impacts and Planning for the Future

held Thursday, October 2, 2003,
on the University of Delaware's Newark campus

Delaware Policy Forum Series

Co-Sponsored by:
Delaware Water Resources Center
University of Delaware, Institute for Public Administration, Water Resources Agency
Delaware Geological Survey
Center for Inland Bays
Delaware Department of Natural Resources and Environmental Control



July 1, 2004

Dear Friends of the Watershed:

We are pleased to present the proceedings of the Delaware Policy Forum titled ***Land Use Change and Water Quality: Assessing the Impacts and Planning for the Future*** held on Thursday October 2, 2003 at Clayton Hall on the University of Delaware campus in Newark, Delaware. The University of Delaware, Institute for Public Administration, Water Resources Agency and Delaware Water Resources Center co-sponsored this event in cooperation with the Delaware Department of Natural Resources and Environmental Control, Delaware Geological Survey and Center for Inland Bays. This was the third in an annual series of policy forums designed to examine water issues in Delaware.

Our speakers expressed a common theme – what happens on the land can affect the quality and quantity of Delaware's water resources. We can conclude that one of the challenges for Delaware's future will be to accommodate economic development of public and private land, with a growing population base, while employing mechanisms to protect the watersheds and aquifers.

We thank the speakers and participants who committed their time to attend this event. Special thanks are offered to the water policy forum organizing committee namely: Amy Boyd, Kathleen Cormier, Amy Dolan, Ruth Fallis, Billy Fasano, Christine Godek, Gerald Kauffman, Jerome Lewis, Kristen Sentoff, Kevin Vonck, Martin Wollaston and Sara Wozniak.

We hope you'll join us next October for future discussions regarding water – our most precious natural resource.

Regards;

Gerald J. Kauffman, PE
Director of Watershed Policy
University of Delaware
Institute for Public Administration
Water Resources Agency

Dr. J. Thomas Sims
Director
University of Delaware
Water Resources Center

These proceedings and the presentations are available on-line at www.wr.udel.edu.

Agenda

8:30 Registration

8:50 Welcoming Remarks
Dr. Jerome Lewis, Director, UD Institute for Public Administration
Dr. J. Thomas Sims, Director, Delaware Water Resources Center

9:00 Land Use Change in Delaware: Historical Perspective and Future Trends
Ed Ratledge, Director, UD Center for Applied Demography and Survey Research

9:30 Delaware's Water Quality: Current Status and Major Challenges
Moderator: Dr. J. Thomas Sims, Director, Delaware Water Resources Center

- State Basin Overview
Kevin Donnelly, Director, Division of Water Resources, DNREC
 - Agriculture and Water Quality
Dr. John Mackenzie, Associate Professor, Department of Food and Resource Economics, University of Delaware
 - Recharge Area Mapping to Protect Water Quality
Scott Andres, Senior Scientist, Delaware Geological Survey
 - NPDES Part II Stormwater Program
David Athey PE, URS Inc.
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10:15 Linking Land Use and Water Quality: A Statewide Effort
Connie Holland, Director, Office of State Planning and Coordination

10:30 BREAK

10:45 Linking Land Use and Water Quality: Local Perspectives
Moderator: Gerald Kauffman, Program Director, Water Resources Agency, Institute for Public Administration, University of Delaware

- New Castle County
Charles Baker, General Manager, New Castle County Department of Planning
 - Kent County
Hans Medlarz, Director, Kent County Department of Public Works
 - Sussex County
Dr. Bruce Richards, Director, Center for the Inland Bays
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11:45 Public Forum and Open Discussion

12:00 Keynote Speech - Governor Minner's Water 2020 On Tap Initiatives
*Lee Ann Walling, Deputy Director/Special Advisor to Governor Minner,
Delaware Economic Development Office*

12:45 Henri Visits Delaware: September 15, 2003 Flooding in the Red Clay Creek
Watershed
*Gerald Kauffman PE, Director of Watershed Policy, Water Resources
Agency, Institute for Public Administration, University of Delaware*
John Talley, Director, Delaware Geological Survey

**Land Use Change and Water Quality: Assessing the Impacts and
Planning for the Future
University of Delaware, Clayton Hall
October 2, 2002**

Welcome to the Delaware Policy Forum Series

Dr. Jerome Lewis, Director, Institute for Public Administration, University of Delaware

Dr. J. Thomas Sims, Director, Delaware Water Resources Center, University of Delaware

Abstract:

Dr. Lewis and Dr. Sims welcomed over 150 attendees to the Delaware Policy Forum addressing land use change and water quality. Dr. Lewis began by thanking the Department of Natural Resources and Environmental Control (DNREC) for their co-sponsorship on this important forum and reminded everyone that this is one in a series of policy forums sponsored throughout the year. Lewis noted that the Institute for Public Administration (IPA) has a strong land use planning group and water resources group that have the capacity necessary to deal with water and land use issues in addition to strong partnerships with state and municipal governments. Dr. Lewis expressed his gratitude for the success of last year's drinking water forum and hoped that using feedback from this year's forum would help increase participation for future forums.

Dr. Sims began by discussing the interesting change in water resources where in just one year we could go from discussing a lack of water due to drought to today focusing on water quality. The largest issue in the state is how we use the land which is a strongly emotional topic, making it difficult for change. Dr. Sims also explained the Delaware Water Resources Center's research and training program and their role in unraveling the water resource issues in Delaware.

Biography:

Dr. Lewis is the first Director of the University of Delaware, Institute for Public Administration. Jerome is a member of the faculty in the School of Urban Affairs and Public Policy and teaches graduate courses in public administration and public policy. The UD Institute for Public Administration links the research and resources of the University of Delaware with the management, information, and leadership needs of schools and local, state, and regional governments in the Delaware Valley. IPA provides assistance to agencies and local governments through direct staff assistance and research projects as well as training programs and policy forums.

Dr. Sims is Associate Dean in the University of Delaware College of Agriculture and Natural Resources and is Director of the Delaware Water Resources Center. Research, teaching, and outreach activities in the area of soil fertility, nutrient management and water quality. Primary research areas have been the cycling, fate, and transport of phosphorus and nitrogen in soils and the development of profitable, environmentally sound agricultural nutrient management practices. Other research has included the development of environmental soil tests for P and N, effects of dietary modification or chemical amendment on P availability in manures and biosolids, the use of municipal and industrial by-products (biosolids, coal fly ash water treatment residuals) as beneficial soil amendments, and trace metal fate and cycling in soils. Authored/co-authored 65 refereed publications, 22 book chapters, a textbook on *Soils and Environmental Quality*, 75+ technical papers and conference proceedings, 30+ fact sheets and notes on soil testing and nutrient management, including the *Nutrient Management Handbook for Delaware*, and more than 120

volunteered presentations at ASA/CSSA/SSSA national meetings. Taught undergraduate and graduate courses in soil fertility and environmental soil science for 18 years, advisor to 24 graduate students and post-docs, directed the University of Delaware soil testing program for 16 years, chaired Mid-Atlantic and Northeastern regional soil testing committees, and currently serve as director of the Delaware Water Resources Center. Organized and/or participated as invited speaker in 11 symposia at ASA/CSSA/SSSA national meetings and 22 symposia in international meetings and for other professional societies. Technical advisor at state, regional, national, and international levels for agencies responsible for water quality protection (Cooperative Extension, local soil Conservation Districts, USDA-NRCS, USGS, USEPA) on development and implementation of nutrient management strategies and environmental policies that prevent nonpoint source pollution of surface and ground waters.

Land Use Change in Delaware: Historical Perspective and Future Trends

Ed Ratledge, Director, UD Center for Applied Demography and Survey Research

Abstract:

Mr. Ratledge commenced his presentation with the comment that he is not a planner or policy maker, but rather an observer. He illustrated the following trends in Delaware demographics:

Population

- Delaware population in 2000 = 783,000; 2003 = 818,000
- Delaware population is growing by about 12,000 people/year; natural growth accounts for about 4500 people/year
- Increase between 2000 and 2003 included 15,000 new housing units
- Delaware population should exceed one million around 2020
- Annual population growth in Delaware ranges between 0 and 2%
- The fastest period of population growth in Delaware occurred in the 1960's when almost 130,000 people were added
- New Castle County handles the bulk of growth in the state, though Sussex County growth will become the larger issue in the next decade
- Mr. Ratledge forecasts a slowdown in population growth in New Castle County that correlates to an economic slowdown (economic growth has been relatively flat since 2000 in New Castle County)

Housing and Land Use

- Current persons per household (2.6) will decrease in 2030 (to 2.1)
- Households are growing faster than the population itself
- There will be a net increase of 50,000 new households in Delaware in the 2000 decade, the majority of these will be single family residences
- 380,000 acres of farmland will be consumed by 2027
- Every household takes about 1½ acres of land to sustain it (roads, transportation, work space, house space, business)
- The fastest growing subset of homeowners are those under age 25
- The largest percentage of households built after 1990 are in southern New Castle County and parts of Kent and Sussex Counties

- The fastest growth areas are the Route 15 corridor in New Castle County, the Inland Bays area of Sussex County

The Future

- Future growth forecasts:
 - New Castle County = growth rates are declining
 - Kent County = fairly steady growth
 - Sussex county = growth rates increasing; will add 40,000 more housing units and 20,000 vacation units each decade
- The demand for water in Southern Delaware will be great as population increases; society will also have to deal with consequences of increases in impervious surfaces

Biography:

Ed Ratledge is a 1972 graduate of the University of Delaware (BS, MA in economics) and currently is the director of the Center for Applied Demography and Survey Research (CADSR). The Center conducts survey research and policy research for a wide range of federal, state, and local government agencies and non-profits.

As a policy fellow and associate professor in the College of Human Resources, Education and Public Policy, Ed has accumulated more than thirty years of experience working with state and local government at both policy and operational levels. His current work spans a variety of areas including development of the Delaware Health Information Network, measuring the total cost of health care in Delaware and the characteristics of the uninsured for the Delaware Health Care Commission, designing and implementing studies of travel behavior in Delaware and the physical impact on the state's road network, producing small area population and employment projections for the state, and developing measures of and attitudes toward options for long-term economic growth . The common thread between these diverse projects is the integration of methods from economics, statistics, demography, and computer science.

He has been a member of Delaware Economic and Financial Advisory Council and the revenue sub-committee since its inception in 1977 and is a member of the board of the Delaware Health Information Network. He is and has been an active member of the Delaware Population Consortium since its inception in 1975. In that role, he works with government and private sector officials to produce annual population and employment projections for Delaware, each county, and the major cities.

In addition, he works extensively in the application of advanced computer technology to combating economic and organized crime. That work is international in scope and ranges from activities with the United Nations in places such as Havana, Cairo, and Moscow. He has also worked with their regional institute, ILANUD, located in San Jose, Costa Rica, the Asian Far East Institute in Tokyo, and police organizations in London and Amsterdam. He has authored a number of papers in the area and published a book dealing with artificial intelligence applied to law enforcement. He helped organize the First International Conference on Expert Systems for Law Enforcement held at the FBI Academy in Quantico Virginia.

Together with his colleague Joan Jacoby of the Jefferson Institute and others he has conducted applied research on prosecution throughout the United States. This research has focused on the

theoretical and practical aspects of the prosecutor's role in the criminal justice system from basic screening decisions to post conviction strategies. In addition, he has designed and is implementing a project for the US Department of Justice, Bureau of Justice Administration to alter the thinking and methods of prosecutors throughout the United States through innovation.

Two books are in progress on this issue.

While Ed was born in Alabama during in 1943 and thus is not a native Delawarean, his family traces its roots in the state from the 1700's. He grew up here and returned to finish school at the University of Delaware after returning from military service in Vietnam in 1970.

Delaware's Water Quality: Current Status and Major Challenges

Moderator: Dr. J. Thomas Sims, Director, Delaware Water Resources Center

State Basin Overview

Kevin Donnelly, Director, Division of Water Resources, DNREC

Abstract:

Mr. Donnelly spoke about the current status and major challenges for the water quality of Delaware. The EPA 305(b) reports indicate that there are a lot of major challenges to improving water quality in the state. These include excess bacteria and nutrient levels (nitrogen, phosphorus). There are also a number of fish consumption advisories that stem from toxics such as PCBs, arsenic, dioxin, DDT, and pesticides in the water. DNREC is working with the Department of Public Health to address these issues. In 2003, DNREC worked on completing TMDLs for the Delaware Estuary, which involved a study of over 100 discrete discharges. Challenges include implementing strategies, funding BMPs, and abating combined sewer overflows (CSOs) in Wilmington. Future projects include a salt water monitoring project in Sussex County, addressing long-term contamination of unconfined aquifers, and improvements in coordination and goal setting.

Biography:

Mr. Donnelly, the director of the Department of Natural Resources and Environmental Control's (DNREC) Division of Water Resources since September 1999, is responsible for overseeing the state's environmental laboratory, monitoring and assessment of the state's ground and surface water quality, the Total Maximum Daily Load program, the use and management of the state's water supplies, and the regulation of discharges into surface waters and underwater lands and tidal wetlands. Donnelly has been active on the Delaware Nutrient Management Commission, the Governor's Environmental Advisory Council, and the Inland Bays Board of Directors. In addition, he serves as an alternate on the Delaware River Basin Commission (DRBC) and a member of the Estuary Implementation Committee (EIC) for the Delaware Estuary Program.

Prior to his present appointment, Donnelly was an environmental program administrator in DNREC's Division of Soil and Water Conservation for eight years. In that capacity he administered the Delaware Nonpoint Source Management Program under the Clean Water Act and the Sediment and Stormwater Management Program. His responsibilities included serving as departmental liaison with the three county conservation districts, the agricultural community and Division representative on DNREC's Environmental Indicator, Whole Basin and DNREC-EPA Performance Agreement workgroups. Donnelly received a Bachelor of Science degree in Forestry

with a minor in Land Use Planning from the University of Maine in Orono. Prior to joining DNREC, he was a senior resource planner and forester with the Delaware Department of Agriculture. He resides in Wyoming with his wife Dot.

Agriculture and Water Quality

Dr. John Mackenzie, Associate Professor, Department of Food and Resource Economics, University of Delaware

Abstract:

Dr. Mackenzie spoke about tracking land use changes over time in Delaware. He noted that the state has consistently lost a higher proportion of its forested areas than its agricultural land to development. In 1974, Delaware had 391,694 acres of forest and 596,000 acres of agricultural land; in 1997, there were 207,620 acres of forest and 538,803 acres of agricultural land. Mackenzie noted that the State does more to preserve agricultural land (it has the highest percentage of agricultural land under protection) than forests even though there are greater benefits in terms of water quality protection that are derived from the latter. He also said water quality issues are complicated by the fact that we draw water from a combination of streams and relatively shallow aquifers. Land use management agencies have been slow to address this relationship. He hopes that citizens will push for basin-level management. He fears that the current political momentum will ease environmental regulations for industry.

Biography:

John Mackenzie is Associate Professor in resource economics and geographic information systems at the University of Delaware. He has conducted research on land-use changes in Delaware since the mid 1980's. He is a trustee of the Delaware chapter of the Nature Conservancy and a member of the Delaware Open Space Council.

Recharge Area Mapping to Protect Water Quality

Scott Andres, Senior Scientist, Delaware Geological Survey

Abstract:

Mr. Andres spoke of the fifteen-year process of developing groundwater protection in Delaware. He believes protecting these resources is important because they have both great economic and environmental value. Andres noted that nearly all groundwater in Delaware starts as precipitation falling on the state; the water that infiltrates, however, often picks up contaminants from the surface and shallow subsurface. Groundwater protection efforts began in the 1980s through mapping and developing ordinances in New Castle County. Mapping and ordinances were added in Kent and Sussex Counties during the 1990s. In 2000, the Delaware Code, Chapter 92, Title 29, established special protection for groundwater recharge areas, with excellent recharge areas having higher protection status. Andres states that the mapping serves as an important tool for land use planning and hazard mitigation. Excellent recharge areas can be found in 14% of Kent County and 8% of Sussex County. It is important to protect these areas, for contaminants move ten times faster and affect 100 times more area when they enter excellent recharge areas.

Biography:

Scott Andres has been a hydrogeologist with the Delaware Geological Survey since 1984 during which time he has worked, published, and presented on a variety of ground and surface water

projects and issues. Recent efforts have focused on watershed monitoring and nutrient loading analysis for the total maximum daily load efforts in the Inland Bays and Nanticoke watersheds, ground-water modeling for wellhead protection area delineations, GIS/DB application development, geology and hydrology of the Cypress Swamp, and ground-water recharge potential mapping. Besides research, Mr. Andres has participated in a number of advisory boards, working groups, and committees at all levels of government and for professional societies. Over the years Scott has worked with and trained dozens of students that have gone on into water resources related careers.

NPDES Part II Stormwater Program

Dave Athey PE, Project Manager, URS Inc.

Abstract:

Mr. Athey spoke of how water is impacted by roads in Delaware. He noted that over 20% of land use in Delaware is designated to road uses. Direct impacts include those of sediment, oils, grease, metals, debris, litter, deicing salts, pesticides, and herbicides that can be measured easily. Indirect impacts include changes to watershed hydrology caused by additional development. Controllable impacts include the amount of paved area, drainage methods, and the amount of traffic. Uncontrollable impacts include precipitation and the receiving waterway. Impacts can be addressed through planning and engineering, education and training, the construction of BMPs. Athey stated that Delaware is addressing the issues through planning programs (DeIDOT long range transportation plan), better management of salt and sand application, analyzing BMP effectiveness, and retrofitting existing facilities. DeIDOT also plans to train employees and the public on illegal dumping, vegetative control, spill prevention, facility, and vehicle maintenance. NPDES programs include wet weather monitoring, dry weather screening and IDD&E, and inventories and inspections.

Biography: Dave Athey has over twenty years of experience in civil engineering analysis, design, and construction including storm drainage systems, detention/retention basins, watershed investigations, best management practices, and sediment and erosion control plans. Employed by the Wilmington office of the URS Corporation, he is currently the Project Manager for DeIDOT's NPDES Phase I Storm Drain Inventory and Inspection Project and is working with other government agencies on implementing NPDES Phase II plans.

He has a Bachelor of Civil Engineering degree from Georgia Tech and a Master of Public Administration from the University of Delaware and is a registered Professional Engineer.

Linking Land Use and Water Quality: A Statewide Effort

Ms. Connie Holland, Director, Office of State Planning and Coordination

Abstract:

Ms. Holland began by introducing two major questions that need to be answered to understand the relationship of land use and water quality:

- What are the effects of land use and planning regarding water quality?
- How are these relationships carried to the local level?

Next she introduced tools that could be used to help address Delaware's issues with land use and water quality.

1. State Strategies for Policies and Spending

As the state's development plan, this document delineates the focus of state investments in infrastructure and development. The major objective of the plan is to support investment in existing infrastructure, such as existing water and wastewater systems

2. House Bill 255

This bill requires municipalities to create a certified plan before annexing. The state planning office works with state agencies and local professionals in determining the appropriateness of plan components. Municipalities must provide a plan of services and impact analysis for areas it desires to annex. One example given was that of Selbyville. Their municipal plan lists water facilities' accomplishments, recommendations for future upgrades and improvements to the water system, a natural resource protection plan that includes intergovernmental coordination with DNREC and TMDL designations in the area.

3. Executive Order #14 (Livable Delaware smart growth initiative)

This order has been a key component of water supply protection in the state. It includes a call for the redrafting of regulations for the use of public water and sewer systems in new development.

4. Delaware River Basin Commission

This multi-state governance body is developing a PCB control strategy including public awareness activities of the issues and the TMDL process working to help mitigate any problems. They are setting the foundations for a workable long-term strategy.

5. PLUS (Preliminary Land Use Service)

PLUS is a new development review process, replacing the Land Use Planning Act (LUPA). It is a product of coordination between DeIDOT, DNREC, and the Office of State Planning and Coordination that provides state agencies with the necessary information and resources to manage development earlier in the review process. While it is an evolving process, the PLUS system seems to be working.

6. Statewide Seamless Parcel Mapping

This type of mapping allows a comprehensive view of land on the parcel level and provides more accurate information for making decisions.

7. Delaware's Spatial Data Framework

Delaware has received a national award for its spatial database that came about through cooperation and assistance from the University of Delaware.

8. Livable Delaware Subcommittees

Governor Minner's initiative to cover a wider range of issues more effectively includes "livability indicators" as guides or standards for measurement.

9. Community Design Guidelines

These guidelines are a product of citizen and state agency efforts over more than 8 months to increase public information efforts and provide motivation for developers. It is one of many publications expected to be released soon.

In conclusion, Ms. Holland reiterated the dedication of the Office of State Planning and Coordination's dedication to protecting the state's waterways and stressed that they are actively working to address the issues involved.

Biography:

Governor Ruth Ann Minner appointed Connie Holland as Director of the Office of State Planning Coordination on August 15, 2001. In this capacity she directs the Office of State Planning Coordination, which serves as staff to the Governor's office, and the Livable Delaware Program.

Connie was born in Wilmington and raised in Smyrna. She has been a Dover resident for more than forty years. She graduated from Dover High School and attended Wesley College and Delaware Technical and Community College. In a career that spans more than thirty years, Connie truly "rose through the ranks" of the Kent County Planning Office, holding positions of Planning Technician, Planner, Planning Services Coordinator, and Supervising Planner. She was unanimously confirmed as Planning Director by the Levy Court and took over the position in December 1993. Connie was appointed Director of Planning Services in July 2000, which broadened her responsibilities to not only that of the Planning Office but also the Inspection and Enforcement Division as well as the GIS division. Connie served in this capacity until her retirement in July 2001.

Connie was nationally recognized in July 2000 with the distinguished title of AICP (American Institute of Certified Planners). She is a member of the National and Delaware Chapters of the American Planning Association (APA) and the Delaware Chapter of the American Society for Public Administration (DAPA). In May 2000, Governor Thomas Carper appointed Connie to serve her second three-year term on the Council for Soil and Water Conservation. She was reappointed for another three years in July by Governor Minner. Governor Minner also appointed Connie as a member of the Cabinet Committee on State Planning Issues in August 2003.

Linking Land Use and Water Quality: Local Perspectives

Moderator: Gerald Kauffman, Water Resources Agency, Institute for Public Administration, University of Delaware

New Castle County

Charles Baker, General Manager, New Castle County Department of Planning

Abstract:

Mr. Baker began by discussing what has been done in New Castle County to protect water quality. First, the 1988 Comprehensive Plan was a large planning effort to expand environmental protection components. Updates to that plan in 1996 and 1997 developed the Unified Development Code with a section devoted to environmental regulations and the designation of specific areas protected from development. In addition, there has been Federal and State protection through the Coastal Zone Acts and wetlands designations. He also stressed that New Castle County is moving forward through the 2002 Plan Update that includes "environment first" ordinance revisions, addresses the issues of interconnected open space, views and scenic historic features, discusses stormwater maintenance cost reduction, develops minimum disturbance/minimum maintenance standards to reduce non-point source pollution, and includes the issue of "green infrastructure". New codes will

require 50% of open space be left untouched during the development process. This, in conjunction with federal and state designations, will protect more than half of the county's land. Looking toward the future, Mr. Baker discussed the need for a unified agency to deal with water policy and the consolidation of water policy and management.

Biography:

Mr. Baker was selected as General Manager of the New Castle County Department of Land Use in January 2001. The Department is responsible for comprehensive planning, land development and subdivision review, site engineering review, building permits and inspections, community governing, code enforcement, customer information and assistance, property tax mapping, and assessment.

Since joining the County, he has worked to make the Land Use Department more responsive and increased the outreach of the Department through community planning efforts. He also took the lead in developing a County-wide Redevelopment Ordinance and the 2002 Update to the County's Comprehensive development Plan. Mr. Baker is currently directing the Department in a number of efforts, including: increasing accessibility to information through the website, making development more environmentally-friendly, improving the historic review process, creating a historic investment tax credit, developing guidelines for the Civic Umbrella grant Program, researching models for farmland and open space preservation, and crafting methods for better linking transportation and land use.

Prior to joining New Castle County, he was Acting Executive Director and Deputy Director at WILMAPCO. While there, he took the lead on projects to link transportation and land use including: mobility friendly design standards, Route 40 and Route 301 studies, and the regional congestion management system. Charles was formerly a transportation planning consultant and held positions with a Transportation Management Association; the Burlington County (NJ) County Engineer's Office; and the Delaware Valley Regional Planning Commission in Philadelphia.

He holds an undergraduate degree in Urban and Regional Planning from Cornell University and has done graduate work at Cornell University and Rutgers University. Charles is a member of the American Planning Association and has served on a wide variety of boards, commissions, task forces, and committees relating to transportation and development in New Castle County and Delaware.

Kent County

Hans Medlarz, Director, Kent County Department of Public Works

Abstract:

Mr. Medlarz discussed how Kent County is attempting to reverse the trend of large lot development. The best tool has been the regulation and management of sewer services. A well-run sewer transmission and management system will help protect water resources. The county's growth zone designation is centered around the sewer district, and has been recently modified to better reflect the available infrastructure. The county has finally revised its sewer and subdivision code for the first time since the mid 1970s, which allows for the county to form alliances between developers to make sewer infrastructure available, and requires a standardized public works agreement as part of the development approval process. There has already been a \$14 million investment by the county currently to expand sewer centralization and service.

Another tool that Kent County is using is Chapter 187 of their county code. This chapter dictates the standards for development inside and outside the growth zone. It provides that virtually no more septic systems will be allowed inside of the growth zone and community wastewater systems will be required in significant developments outside the growth zone. The Code allows for a higher degree of rural planning and responsibility for rural development. This also includes provisions for the protection of existing buffers and the creation of buffers where they are absent. In addition, Chapter 187 contains provisions for woodland preservation: 30-60% inside growth zone, 90% outside growth zone and flood plain protection.

Chapter 180 of Kent County Code has also been used to mitigate against problems. It addresses sewer development outside of the growth zone and requires that new development be located adjacent to an existing sewer district. It also requires developers to meet source water protection standards and requires woodland protection. In conclusion, Mr. Medlarz emphasized the high priority that Kent County has put on water resource protection in order to maintain residents' quality of life.

Biography:

Experience Summary:

Experience includes project management and design services for water and wastewater projects including storage, distribution, treatment plants, pumping stations and pipeline networks. Performance of facilities plans, grant administration, user charge analysis and project financial management. Extensive experience in site engineering, including site planning, subdivision design, storm water management and entrance design. Consultant to the following Delaware municipalities: City of Milford, City of Dover, Town of Georgetown, Town of Frederica, Town of Smyrna, City of Harrington, Town of Felton and the City of Rehoboth Beach among others.

Education:

Master of Civil Engineering, Structural and Soils Karlsruhe Technical University, Germany 1985

Master of Civil Engineering, Hydraulics and Hydrology Georgia Institute of Technology, 1979

Bachelor of Science, Civil Engineering Karlsruhe Technical University, Germany 1977

Registrations:

VA/1986/Civil Engineering/16598

NC/1990/Civil Engineering/17073

DE/1993/Civil Engineering/9418

Experience:

2002-Present, Kent County Levy Court, Dover, Delaware,
Director of Public Works

1991-2002, Davis, Bowen & Friedel, Inc., Milford, Delaware
Principal

Sussex County

Dr. Bruce Richards, Director, Center for Inland Bays

Abstract:

Dr. Richards began by mentioning the following characteristics of Sussex County:

- Sussex County is extremely diverse.
- There exists a large difference between the coastal and inland areas.
- Property values in the coastal area have dramatically increased over the past few years.
- There has been a very significant population growth in the county.
- Land use conflicts exist between the coastal and rural areas, and some property rights issues have arisen.
- Rapid growth in the county has created a significant loss of open space and habitat.
- There has been increased pressure on developers to create innovative designs, creating a dilemma due to the difficulty of moving unique designs through the approval process.

In order to combat some of the issues that Sussex County is facing, in December of 2002 a 5 year County Land Use Plan was adopted. It created an “environmentally sensitive zone” around the inland bays. As part of the implementation process the plan includes the development of a new ordinance that dictates specific performance and process requirements for development around these sensitive areas. In addition to the benefits of the Land Use Plan, improved language in the Sussex County Codes is expected to protect sensitive areas and regulate the impervious surfaces near them.

Future issues to be dealt with in Sussex County include nutrient pollution, the use of septic systems, protection of threatened and endangered species, and preservation of open space and traffic impacts on environmental quality.

Biography:

Bruce Richards is the first Executive Director of the Center for the Inland Bays, starting in this position in October of 1995. His responsibilities include the administration and management of the Center’s mission to preserve and restore the resources of Delaware’s Inland Bays (Indian River, Rehoboth and Little Assawoman Bays) through the implementation of the State’s Comprehensive Conservation and Management Plan for the Inland Bays mandated by Governor Thomas Carper and EPA Administrator Carol Browner in 1995. The Center for the Inland Bays has supported marine and agricultural research programs to improve water quality health and increase aquatic and upland habitat, conduct educational programs, restore fragile habitats and improve policies promoting the wise use of the Inland bays. Bruce has a Bachelor’s in Animal Science from the U of DE and Master’s in Agriculture, and a PhD in Non-Profit Administration from Penn State University; he is currently pursuing a part-time MS in Biological Oceanography from the College of Marine Studies of the U of DE in Lewes. Prior to taking this position, Dr. Richards worked in the Cooperative Extension Service of the College of Agricultural Sciences of Penn State in South East Pennsylvania.

Keynote Speech – Governor Minner’s Water 2020 On Tap Initiatives

Lee Ann Walling, Deputy Director/Special Advisor to Governor Minner, Delaware Economic Development Office

Abstract:

Lee Ann Walling commenced her presentation by thanking all those who helped to get Delaware through the Drought of 2002. In order to rebound from the drought, many steps have been taken. First, 1.1 billion gallons of additional storage have been created since 1999. Second, Governor Minner developed a Water Supply Agenda leading to House Bill 118 Water Supply Self Sufficiency Act. This piece of legislation required mandatory conservation rates to be adopted by 2005 and certification by each water utility by 2010 that they have sufficient in state supply to meet demand during a similar drought. Third, the Water Supply Coordinating Council (WSCC) was expanded to include more important voices in water resources in Delaware. In addition, the WSCC is developing a 3-phase drought operating plan to provide early warning of problematic conditions. Fourth, there has been \$600,000 in loans to replace wells that failed during the drought. Fifth, raising the level at Hoopes Reservoir has become an option to provide a 3-foot increase and 200 million gallons of additional storage. Finally, Bread and Cheese Island is going to be purchased by DelDOT in order to provide for a possible future reservoir site, which is believed to not be needed but steps are being taken just in case.

Ms. Walling continued her discussion by pointing out those issues that are facing water resources today and are being looked into by Delaware officials. First, urbanization, topography and poor subdivision planning have become factors in the recent increased flooding and need to be addressed. Aging infrastructure, growth issues and stormwater management have been recognized as problems and are being addressed by HB255. Finally, Livable Delaware has been able to resolve water supply issues, invest in efficient use of space, and create more jobs by developing infrastructure and support smart community growth.

Biography:

Delaware Economic Development Office

December 2002 to present

Deputy director and special adviser to Governor Minner

- Responsible for Governor’s quality of life policy agenda, including Livable Delaware land-use legislation and policy, sustainable economic development, brownfields, water supply, and industrial accountability; liaison with Department of Natural Resources and Environmental Control
- Adviser to director on strategic planning, realignment and reorganization
- Chair of Cabinet Committee on State Planning Issues and member of Governor’s Advisory Council on Planning Coordination (Livable Delaware Advisory Council)
- Special projects as assigned by Governor

Office of the Governor

November 2000 to December 2002

Senior adviser to Governor Minner/transition team

- Chief policy adviser to the Governor and liaison to Governor’s Cabinet

- Conceived, developed and implemented Governor’s Livable Delaware agenda
- Supervised policy staff, constituent relations staff, Washington office, support staff
- Headed Governor-elect’s transition team on Transportation, Planning and Administrative Services
- Chaired Drought Advisory Committee during 2002 drought of record

State Treasurer’s Office
Deputy State Treasurer

January 1999 to November 2000

- Responsible for daily operations of office that oversees the reconciliation of state’s major collections, disbursement and other accounts; the setting of the state’s daily cash position; printing of state checks; and accounting for General Obligation debt service and interest on state accounts
- Spearheaded several operational improvements that eliminated paper-intensive, time consuming processes through the use of technology and re-engineered processes
- Overhauled the state’s deferred compensation (similar to 401k) program and legislatively secured a state match for participating employees
- Planned and staged two successful “Everywoman’s Money Conference” events

Department of Finance
Deputy principal assistant

December 1996 to January 1999

- Chief fiscal officer for department that includes Revenue, Lottery, Accounting and Office of the Secretary; developed department’s budget for three fiscal years
- Acting director, Division of Accounting
- Championed re-engineering initiatives for the new state payroll system, including biweekly pay

Office of the Lieutenant Governor
Executive Assistant

January 1993 to December 1996

- Staffed Commission on Government Reorganization and Effectiveness (Minner Commission) and subsequent Governor’s Task Force on Workforce Quality and Personnel Reform
- Chaired Executive Committee, Interagency Council on Adult Literacy, and developed Lieutenant Governor’s adult education agenda

Journalist

1986 through 1992

- Print: News Journal, Delaware State News, News-Texan Inc. (Dallas), Daily Texan (Austin)
- Broadcast: KOSA-TV (Odessa, Texas), KTVV-TV (Austin), and KUT-FM (Austin)

Education

- Bachelor of Journalism, University of Texas at Austin, 1977
- Master of Business Administration, University of Delaware, 1999

Henri Visits Delaware: The September 15, 2004 Flooding in the Red Clay Creek Watershed

Gerald Kauffman, Director of Watershed Policy, Water Resources Agency, Institute for Public Administration, University of Delaware

John Talley, Director, Delaware Geological Survey

Abstract:

:On Monday, September 15, 2003, the remnants of Tropical Storm Henri caused historic flooding in the Red Clay Creek watershed in Pennsylvania and Delaware. After reviewing precipitation and stream gage data, floodplain and watershed mapping, we can conclude that the damage along the Red Clay Creek during that event resulted from a combination of four factors: (1) a storm with high-intensity, short duration rainfall, (2) saturated soil conditions from previous storms, (3) a hilly, rocky watershed, and (4) urbanization within the floodplain and surrounding watershed. While the first three factors are natural occurring, the last is a result of human activity.

The complete Water Forum presentation on the flooding, including Red Clay Creek watershed and floodplain maps, graphs updated as of Nov. 11, 2003 indicating creek cumulative rate of rise, cumulative precipitation, peak discharges, and peak gage heights of record associated with several New Castle County creeks, and 13 annotated storm photos, is now online at <http://ag.udel.edu/dwrc/news.html>. In summary, more than 10 inches of rain fell in a 5-hour period in the upper Red Clay drainage basin according to Doppler radar interpretation by the Office of the Delaware State Climatologist, exceeding the 24-hour 100-year return period value of 8 inches for the area. The 3-hour 100-year period value of 4 inches of rain was also greatly exceeded. This was a localized event that would not be expected to occur more than once in a 100-year period. The recorded peak discharge flood flow at the USGS Red Clay at Wooddale Gage, generated in a relatively small drainage area of 47 square miles, exceeded 32,000 cubic feet per second (cfs), the highest peak discharge on record dating back to 1943. The next highest peak flow of 7650 cfs occurred during Hurricane Floyd on September 16, 1999. The 500-year flow discharge at this location, according to the Federal Emergency Management Agency (FEMA) Flood Insurance most recent 1993 study for New Castle County, is 14,300 cfs. The watershed's soils have low to moderate infiltration rates causing naturally high runoff ratios, and its steeply sloped, funnel-shaped topography has a natural propensity for flash floods

New Castle County's Unified Development Code of 1997 barred development within the 100-year floodplain along the Red Clay Creek, but urbanization had occurred there decades before, particularly between Stanton and Yorklyn, altering the area's ability to store floods. Over 200 properties situated within the Red Clay Creek floodplain were damaged during Henri's aftermath. The overall level of urbanization [defined as the ratio of built-upon or paved-over land surfaces to forested, agricultural, or otherwise "open" landscapes] in the upstream portion of the Red Clay Creek watershed in Delaware and Pennsylvania is quite low. However, urbanization in the creek's downstream subwatershed, near Marshallton and Stanton, is quite high. Latest statistics show that the impervious cover ratio of the overall watershed is around 15%; the runoff ratio in a watershed increases markedly when the impervious cover exceeds 20%. The impervious cover of the subwatershed below Wooddale, near the greatest flooding at Glenville and Stanton, exceeds 30%, thus delivering higher stormwater runoff to the floodplain.

In response to the destruction caused by Tropical Storm Henri, federal, state, and local governments are considering alternatives such as acquisition of properties in the Glenville area and restoration of

the area as a wetland. The best way to mitigate flood damage is to preserve the floodplain and allow it to perform its intended function, storing floods.

Biography:

Gerald Kauffman is the Director of Watershed Policy with the University of Delaware, College of Human Services, Education, and Public Policy, Institute for Public Administration, Water Resources Agency. Along with the staff at the WRA, Mr. Kauffman is responsible for providing regional water resources technical and policy assistance to state and local governments in Delaware and the Delaware Valley through the University's public service, education, and research role. These responsibilities include appointment as the State Water Coordinator, serving as the local watershed coordinator for the Christina Basin Clean Water Partnership and White Clay Creek Wild and Scenic River, teaching courses in Regional Watershed Management and Water Resources Engineering, and establishing the University of Delaware's first Experimental Watershed. He is the author of "The Anatomy of a Drought" in the 1998 book edited by Robert Reimold: *Watershed Management Practice, Policies, and Coordination*, McGraw Hill. Gerald received the Bachelor of Science degree in Civil and Environmental Engineering from Rutgers University (concentration in water resources) and is a Certified Public Manager (Level III) awarded by the Rutgers University Graduate Program in Public Administration. He holds a Master of Public Administration (MPA) degree from the University of Delaware. Mr. Kauffman has been registered as a professional engineer (PE) in 4 states and has 20 year's experience in water supply, water resources and watershed management.

Biography:

John H. Talley is Director of the Delaware Geological Survey at the University of Delaware. He has been with the Survey for 30 years. Prior to joining the Survey he was an engineering geologist with a soil and foundation consultant. He holds a B.A degree from the University of Delaware and an MS degree from Franklin and Marshall College. He is author or co-author of more than 50 publications and reports pertaining primarily to applied geology, hydrology, and geologic hazards in the Atlantic Coastal Plain and Piedmont. Mr. Talley is a registered geologist in Delaware and Pennsylvania, and a Certified Professional Geologist of the American Institute of Professional Geologists.

**Land Use Change and Water Quality: Assessing the Impacts and
Planning for the Future**
University of Delaware, Clayton Hall
October 2, 2003

What did you like best about the forum?

- Good broad range of related topics discussed.
- Timing was good.
- The big picture was well presented.
- Lots of sound data – rather depressing but good background to move forward with.
- Variety of speakers.
- Information on BMPs and TMDLs and land use relating to water quality.
- It was needed.
- Topic was very interesting.
- Good speakers.
- Networking.
- Good data shared.
- Engaging speakers.
- Good location, refreshments/food.
- Besides info from speakers – chatting with other people who had interest in same topics.

What can be done to improve future Delaware Policy Forums?

- More on SWM and land use planning and conservation design.
- Need more time for audience feedback and discussion.
- Expand time 1 hour.
- More time for public comments and discussion.
- Meet in the central part of the state.
- Either reduce # of speakers or allocate more time for them to speak.
- Have more time for people to talk in small groups with speakers.
- Stay on time!! Don't add last minute items unless they are noted at the beginning of the conference. Time is important!!
- Maintain timelines.
- Include organizations involved on BMPs and more time on each issue.
- Longer day – to really dive into issues speakers needed more time to really, thoroughly discuss issues.
- Stay on time! The management of each session was very poor!!!
- Fewer speakers so don't feel so rushed.

What topics would you like to see covered in a future Delaware Policy Forum?

- More topics on how to control and best develop the state.
- Urbanization/Water Quality.
- Would like to see these issues discussed by government, environmental and developer's perspective. These are all the key players in any water issue.
- Continue on water issues-not sure next topic but we need to keep the focus on it!
- Which BMP is most effective for N and P.

- Air pollution, smart growth, invasive species, fisheries, real estate issues, and habitat restoration.
- Perhaps riparian buffers to promote concept – “messy is good” along stream banks – don’t have to manicure hedgerows which destroys filtration and wildlife habitat.

Comments:

- All great.
- This was well worth the time away from the office.
- Food was exceptional.
- The charts and words were too small to read enlarge by 25%.
- Where was Sussex P/Z perspective...Richards is not local government.
- Room for meeting was rather too cool.
- Too cold to sit for hours, turn down the A/C!!
- Good facility, but cold.
- Great location!
- Facility and food are excellent.
- Good planning by committee, thank you!!!
- Facility fine, choices and diversity of food delicious.

2003 Water Policy Forum Participants

LAST	FIRST	TITLE	ORGANIZATION	ADDRESS	CITY	STATE	ZIP	PHONE
Andres	Scott	Senior Scientist	DE Geological Survey	214 DE Geological Survey	Newark	DE	19716	302-831-0599
Anthony	Richard	Vice Chairman	Sierra Club	P.O. Box 653	Lewes	DE	19958	302-645-1732
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Blake	Michael	Acct.&Supp.Serv.	United Water Delaware	2000 First State Blvd.	Wilmington	DE	19804	302-633-5905
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Burcat	Bruce	Executive Director	Delaware PSC	861 Silver Lake Blvd.	Dover	DE	19904	302-739-4247
Campagnini	Jennifer	Env. Scientist	State DNREC	820 Silver Lake Blvd.	Dover	DE	19901	302-739-4590
Carter	David	Environ. Prog. Mgr.	State/DE Coast. Program	89 Kings Highway	Dover	DE	19901	302-739-3451
Cherry	Philip	Dir. Of Policy & Planning	State DNREC	89 Kings Highway	Dover	DE	19901	302-739-4403
Chirnside	Anastasia	Associate Scientist	University of Delaware	Bioresources Engineering	Newark	DE	19716	302-831-8871
Church	Dr. Tom	Professor	University of Delaware	College of Marine Studies	Newark	DE	19716	302-831-2558
Cocke	Bill	Program Manager	State DNREC	89 Kings Highway	Dover	DE	19901	302-739-4793
Cole	Kimberly	Environ. Scientist	State/DE Coast. Program	89 Kings Highway	Dover	DE	19901	302-739-3451
Cole	Randy	NPDES Program Mgr.	DELDOT	P.O. Box 778	Dover	DE	19903	
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Donahue	Suz	Res. Conservationist	Chester County Con.Dist.	601 Westtown Road	Chester	PA	19380	610-696-4980
Donnelly	Kevin	Director	State DNREC/Water Res	89 Kings Highway	Dover	DE	19901	302-739-4860
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Dwivedy	Ramesh		Greeley and Hansen	1818 Market St. Suite 3400	Philadelphia	PA	19103	215-563-3460
Dworsky	Bernard	Asst. Dir. For Spec.Proj.	U of D/IPA	Graham Hall	Newark	DE	19716	302-831-8710
Fallis	Ruth	Admin. Asst	UofD/IPA/WRA	DGS Annex	Newark	DE	19716	302-831-4925
Fasano	Billy	Research Assistant	UofD/IPA	116 Persimmon Pl	Bear	DE	19701	302-838-8768
Fifer	Carlton		DE Nutrient Mgt.	1919 Allabands Mill Rd.	Wyoming	DE	19934	302-697-2141
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Gangemi	Mario		Duffield Associates, Inc.	5400 Limestone Road	Wilmington	DE	19808	302-239-6634
Gilbert	Jennifer	Graduate Student	University of Delaware	Plant & Soil Science Dept.	Newark	DE	19716	302-831-4190
Gneo	Ron	Water Resources Engg.	R K & K	81 Mosher St.	Baltimore	MD	21217	410-462-9287
Godek	Christine	Graduate Research Asst	U of D/IPA/WRA	DGS Annex	Newark	DE	19716	302-831-4931
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Grehl	Elaine	Fellow	Longwood Grad. Program	UofD - 126 Townsend	Newark	DE	19716	302-831-2517
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Hamlen	Ron			9 Lochcarron Drive	Elkton	MD	21921	410-398-7697
Hansen	Peder	Env. Program Mgr.	State DNREC	89 Kings Highway	Dover	DE	19901	302-739-5731
Harrison	John			2 Kent Drive	Hockessin	DE	19707	302-239-4322
Heaton	Debbie	Conservation Dir.	Sierra Club	100 West 10th St.	Wilmington	DE	19801	302-425-4911
Heffron	Rich	Interim President	DE State Cham of Comm	P.O. Box 671	Wilmington	DE	19899	302-576-6563
Hokuf	Douglas	Civil Engineer	New Castle County	87 Reads Way	New Castle	DE	19720	302-395-5448
Holland	Constance	State Planning Director	State of Delaware	540 South DuPont Highway	Dover	DE	19904	302-739-3090
Hollenbeck	Steven	Env. Coordinator	DDA-Nutrient Mgmt.Com.	2320 South DuPont Hghwy	Dover	DE	19901	302-698-4558
Homsey	Andrew	GIS Analyst	UofD/IPA/WRA	DGS Annex	Newark	DE	19716	302-831-4933
Houghton	John	Supervisor/Com	Artesian Water Co.	664 Churchmans	Newark	DE	19702	302-453-5809

		m. Rel.		Road				
Houston	James	Env. Compliance Mgr.	New Castle County	87 Reads Way	New Castle	DE	19720	302-395-5802
Hughes	Kristen	Graduate Student	University of Delaware	27 Cheswold Blvd. 3-A	Newark	DE	19713	302-369-0295
Hyde	Jim	Graduate Student	UofD/PLSC					
Inden	Herb	Principal Planner	Office of State Planning	540 S. DuPont Hgwy	Dover	DE	19901	302-739-3090
Ingles	Michael	Graduate Student	UofD/Ctr.Energy& Env.Pol.	405 Hopkins Road	Newark	DE	19711	302-737-8841
Irvin	Dale		NCC Eco. Devel.Council					302-368-5700
Jennings	Jennifer	Env. Scientist	State DNREC	220 Silver Lake Blvd.	Dover	DE	19901	302-739-4590
Johnson	Leigh	Grad. Student	U of D - Civil & Env. Engg.	301 DuPont Hall	Newark	DE	19716	302-831-6088
Johnson	Janet	Associate Professor	UofD/Dept. of PoliticalSci	462 Smith Hall	Newark	DE	19716	302-831-1928
Johnson	Valerie			230 Steeplechase Circle	Wilmington	DE	19808	302-239-1410
Jones	Lyle	Program Manager	State DNREC	220 Silver Lake Blvd.	Dover	DE	19904	302-739-4590
Kalb	Joanne							
Kauffman	Gerald	Project Director	UoD/IPA/WRA	DGS Annex	Newark	DE	19716	302-831-4929
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Kraeuter	Bruce	Vice President	Artesian Water Co.	664 Churchmans Road	Newark	DE	19702	302-453-5809
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Lank	Lawrence	Director	Sussex Co./Planning	P.O. Box 417	Georgetown	DE	19947	302-855-7878
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Lovell	Stewart	Program Manager	State DNREC	89 Kings Highway	Dover	DE	19901	302-739-4793
MacArtor	June			93 Caravel Drive	Bear	DE	19701	302-834-8650
Mackenzie	Dr. John	Asso. Professor	Dept. of Food&Res. Eco.	U of D/215 Townsend Hall	Newark	DE	19716	302-831-1312
Matlack	Alexis	President	Soc. Of Natural Hist/DE	3751 Mill Creek	Hockessin	DE	19707	
Matlack	Elsie		Soc. Of Natural Hist/DE	3751 Mill Creek Road	Hockessin	DE	19707	302-239-5383
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Payne	William B.		Citizen's Coalition	150 Heather Dr.	Lewes	DE	19958	302-945-2328
Piorko	Frank	Program Manager	State DNREC	89 Kings Highway	Dover	DE	19901	302-739-4411
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Probert	Dana	Project Manager	Environ. Con. Intern. Corp.	220 Rehoboth Avenue	Rehoboth Beach	DE	19971	302-226-2844
Ratledge	Edward	Director	U of D/Ctr. Applied Demo.	282 Graham Hall	Newark	DE	19716	302-831-1684
Rayner	Marlene	Editor	Delaware Sierra News					302-571-8097
Richards	Dr. Bruce A.	Executive Director	U of D	467 Highway One	Lewes	DE	19958	302-645-7325
Rohrer	Kate	Dir-Kent/Sussex	Cong. Castle's Office	300 S. New Street	Dover	DE	19904	302-736-1666
Rohrer, Jr.	William	Prog. Administrator	DDA - Nutrient Mgmt. Co.	2320 South DuPont Hghwy	Dover	DE	19901	302-698-4558
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Satterfield	Bill	Executive Director	Delmarva Poultry Industry	16686 County Seat Highway	Georgetown	DE	19947	302-856-9037
Scarborough	Dr. Robert	Env. Scientist	State/DE Coast. Program	89 Kings Highway	Dover	DE	19901	302-739-3451
Schaffer	Bill	Public Utilities Advocate	Delaware PSC	861 Silver Lake Blvd.	Dover	DE	19904	302-739-4247
Schneider	John	Env. Program Admin.	State DNREC	820 Silverside Lake Blvd.	Dover	DE	19904	302-739-4590
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Scozzafava	Michael	Grad. Research Asst.	Ctr. Energy and Env. Pol.	508 Stonegate Blvd.	Elkton	MD	21921	410-620-1689
Sentoff	Kristen	Student	U of D/IPA/WRA	396 S. College Avenu	Newark	DE	19711	302-731-2739
Sims	Dr. J. Thomas	Director	DE Water Res. Center	152 Townsend Hall	Newark	DE	19716	302-831-1389
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Stapleford	Linda	River Administrator	White Clay Creek W & S	802 Dallam Road	Newark	DE	19711	302-731-1756
Svatos	Vern	GIS Manager	U of D/IPA/WRA	DGS Annex	Newark	DE	19716	302-831-4932
Swift	Gregory	Civil Engineer	New Castle County	87 Reads Way	New Castle	DE	19720	302-395-5553
Talley	John	Interim Dir/St. Geologist	DE Geological Survey	DE Geological Survey Bldg.	Newark	DE	19716	302-831-8258
Toor	Gurpal	Postdoctoral Researcher	University of Delaware	Plant & Soils Dept.	Newark	DE	19716	302-831-4190
Trushell	Nancy	Act. Gen. Manager	United Water Delaware	2000 First State Blvd.	Wilmington	DE	19804	302-633-5905
Van Name	Judy	Assoc. Professor	University of Delaware	Consumer Studies	Newark	DE	19716	302-831-8548
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Wheeler	Michael	Research Associate	UofD/Ctr. Energy & Env. Pol.	Graham Hall	Newark	DE	19716	215-880-0760
Williams	Stephen	Ecological	State DNREC	89 Kings	Dover	DE	19901	302-739-4403

		Restor.Coord.		Highway				
Willis	Bonnie	Environ. Scientist	State/DE Coast. Program	89 Kings Highway	Dover	DE	19901	302-739-3451
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Woodcock	Brian			2845 Creek Road	Yorklyn	DE	19736	302-239-3110
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Yurick	Bob		Greeley and Hansen	1818 Market St. Suite 3400	Philadelphia	PA	19103	215-563-3460
Zappile	Carmen	Chief/Basin Planning	US Army Corps of Eng.	100 Penn Square East	Philadelphia	PA	19107	215-656-6592



Amy Boyd from the Delaware Water Resources Center distributing information.



Ed Ratledge discusses population trends in Delaware.



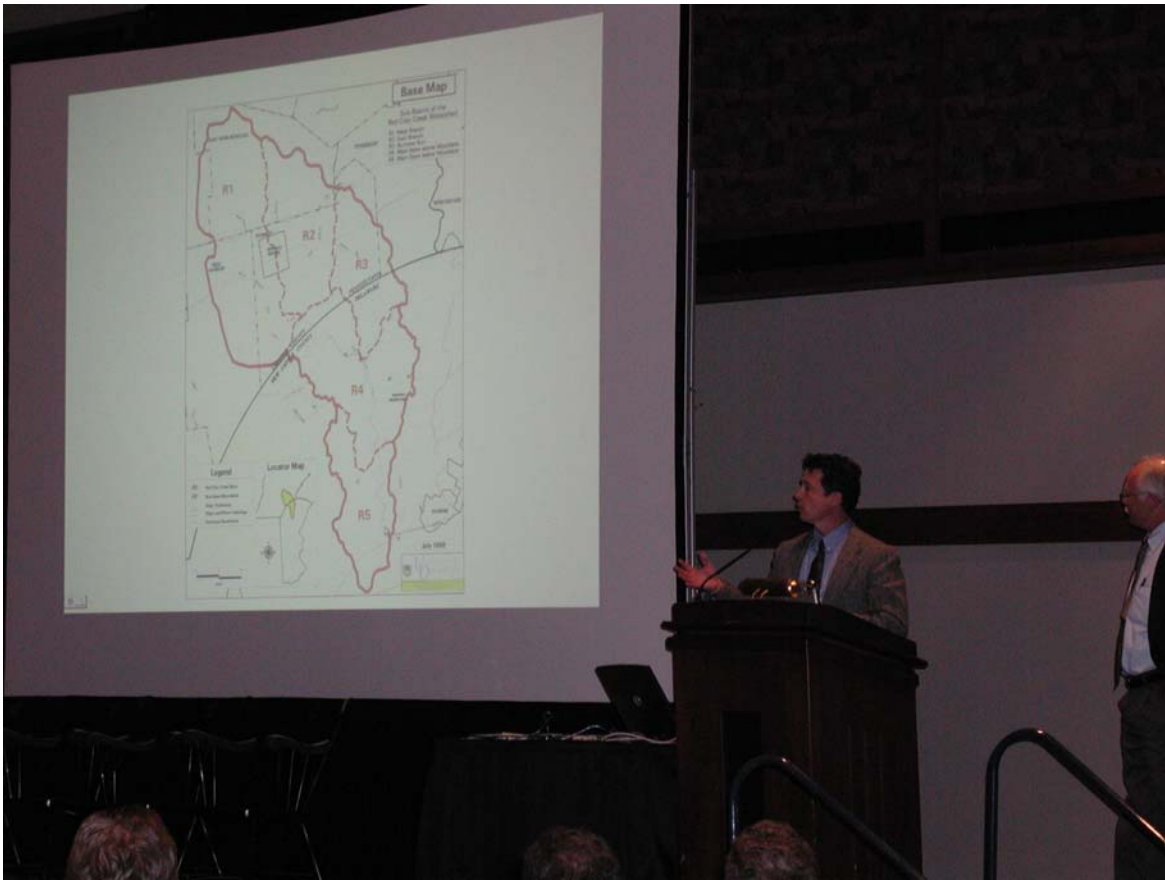
Dr. Jerome Lewis in foreground, left.



Kevin Donnelly reviews the state of water resources in Delaware.



Lee Ann Walling describes Governor Minner's Water 2020 On Tap Initiative



John Talley and Gerald Kauffman discuss the September 15, 2003 Flood from Tropical Storm Henri.



John Talley, Director of the Delaware Geological Survey.

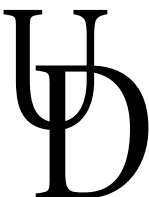


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The Water Resources Agency (WRA) provides technical assistance for water resources and watershed policy and to governments in Delaware and the Delaware Valley through the University's public service, education, and research role. Our program is funded by four governments - the State of Delaware, New Castle County, City of Newark, and City of Wilmington along with grants from public and private sources. WRA's main office is on the University's Newark campus in the DGS Annex Building off Academy Street. Gerald Kauffman is the director of the Agency and can be reached at 302-831-4929.



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